

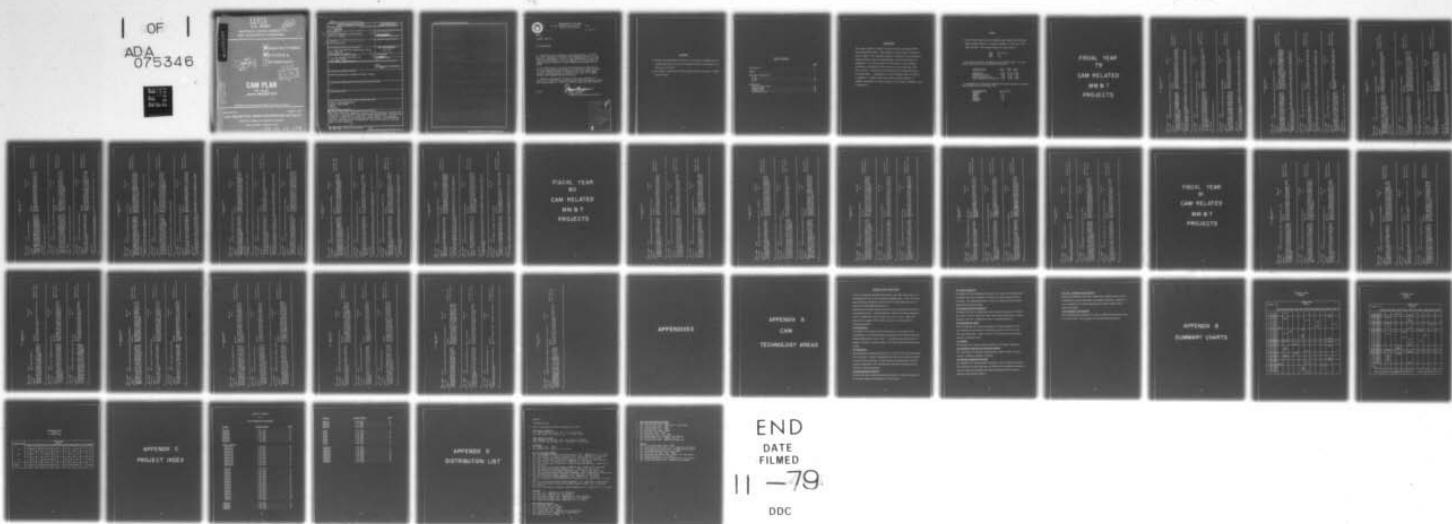
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ARMY INDUSTRIAL BASE ENGINEERING ACTIVITY ROCK ISLAND IL F/G 13/8  
MANUFACTURING METHODS AND TECHNOLOGY CAM PLAN FY 1979-1981.(U)  
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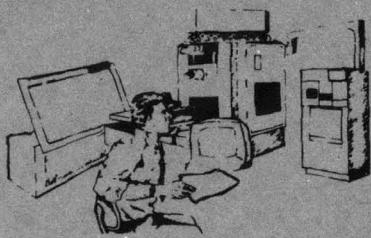
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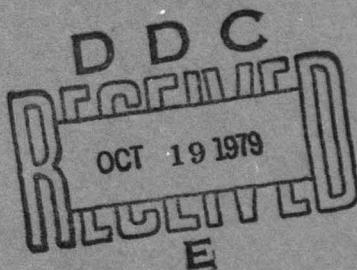
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LEVEL  
U.S. ARMY  
MATERIEL DEVELOPMENT  
AND READINESS COMMAND

12



MANUFACTURING  
METHODS &  
TECHNOLOGY



**CAM PLAN**

FY 79-81

~~RCS: DRCMT-304~~

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PREPARED BY

AUGUST 1979

**USA INDUSTRIAL BASE ENGINEERING ACTIVITY**

MANUFACTURING TECHNOLOGY DIVISION

ROCK ISLAND, ILLINOIS 61299

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report provides a summary of the Army's FY 79-81 Manufacturing Methods and Technology Program directed toward computer-aided manufacturing. The following information is provided for 61 projects. Project number, title, projected funding, a statement of the problem and proposed solution, and the technology area into which the project is categorized. The current status of FY 79 projects is also provided.		

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DEPARTMENT OF THE ARMY  
US ARMY INDUSTRIAL BASE ENGINEERING ACTIVITY  
ROCK ISLAND, ILLINOIS 61299

5 SEP 1979

DRXIB

SUBJECT: CAM Plan

SEE DISTRIBUTION

1. Inclosed for your information is the Army CAM Plan for FY79-81. This plan, published in accordance with DARCOM Regulation No. 15-13, provides a comprehensive picture of where DARCOM plans to invest MMT funds on CAM technology. Lists and summaries of the individual CAM related projects submitted by various DARCOM organizations are provided.

2. This Plan is one of the initiatives being taken by IBEA and the Office of Manufacturing Technology to take advantage of CAM technology in a more systematic manner. Coordination with other DARCOM organizations on this program will be carried out by means of the DARCOM Computer Aided Manufacturing Steering Group.

3. Questions regarding the contents of this report should be directed to Mr. Jim Sullivan, US Army Industrial Base Engineering Activity, Rock Island Arsenal, IL 61299; AV 793-6172, commercial (309) 794-6172.

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JAMES W. CARSTENS  
Acting Director  
Industrial Base Engineering Activity

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- The data provided within this report is provided for planning and discussion purposes only and not as information usable in pricing or contracting for the work.
- The projects listed and the dollar amounts shown are subject to change without notice.

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## INTRODUCTION

This report contains a listing of the active FY79 and planned FY80-81 CAM related MMT projects. Data presented on each project includes the project number, title, projected funding, a statement of the problem and proposed solution, and the technology area into which the project is categorized. The current status of FY79 projects is also provided. Information is presented in three sections, one for each year, FY79, FY80, and FY81. Within each section projects are grouped according to technology areas. A description of these technology areas is provided in Appendix A. Summary charts and an index relating projects to commands responsible for project execution are included at Appendix B and C respectively.

## SUMMARY

- The CAM Plan identifies the 61 Manufacturing Methods and Technology (MMT) projects planned for funding by DARCOM in fiscal years 1979, 1980, and 1981. The proposed funding for those years is:

FY79	\$8.3 Million
FY80	5.3
FY81	8.9

- The projects are also identified by ten technical areas. The technical areas proposed for the greatest funding are:

<u>Technical Area</u>	<u>FY79</u>	<u>FY80</u>	<u>FY81</u>
Fabrication	\$3.0M	\$1.4M	\$2.8M
CADCAM Interaction	1.2M	0.1M	2.5M
Manufacturing Control	0.9M	2.2M	2.4M
Test, Inspection & Evaluation	1.6M	0.8M	0.3M

- The DARCOM Major Subordinate Commands which have proposed the largest CAM Programs for the three years are:

ARRCOM/ARRADCOM	\$8.1 Million
TARADCOM	4.0
ERADCOM	3.2
MICOM	2.9
CORADCOM	2.8
AVRADCOM	1.6

FISCAL YEAR  
79

CAM RELATED  
MM & T  
PROJECTS

PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* 5 79 6736	TECH READINESS ACCEL THRU COMPUTER INTEGRATED MFG (CAD)	256	
PROBLEM	SOLUTION		
*** * THE LEAD TIME REQUIRED TO BRING PRODUCTION LINES	THE DEVELOPMENT AND IMPLEMENTATION OF A COMPUTER I		
TO MOBILIZATION MAXIMUM IS INTOLERABLY EXCESSIVE.	INTEGRATED MANUFACTURING SYSTEM WILL SIGNIFICANTLY		
A CRITICAL DETERENT IS THE EXTREME SHORTAGE OF	REDUCE THE REQUIREMENT FOR HIGHLY SKILLED CRAFTSMEN.		
TOOLMAKERS AND MACHINISTS.	N.		
WORK STATUS			
*** * PROCUREMENT PACKAGE WAS PREPARED TO DESIGN AND DEVELOP AN ARCHITECTURE FOR COMPUTER INTEGRATED MANUF			
ACTURE OF AMMUNITION METAL PARTS WITH REDUCED LEAD TIME. PROCEDURES AND DOCUMENTATION ARE BEING PREP			
ARED FOR PRODUCTION TOOLING.			
*** * - - - - -			
PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* 1 79 7183	SEMI-AUTO COMPOSITE MFG SYSTEM-HELICOPTER FUSELAGE STRUCTURES	100	
PROBLEM	SOLUTION		
*** * HELICOPTER FUSELAGE STRUCTURES HAVE HIGH MANUFACT	FABRICATE AND DEMONSTRATE A SEMI-AUTOMATED COMPOSI		
URING COST DUE TO HIGH PART COUNT AND HIGH ASSEMB	TE MANUFACTURING SYSTEM FOR THE PRODUCTION OF CCP		
LY COSTS. METHODS OF COMPOSITE FABRICATION HAVE BEEN	OSITE HELICOPTER FUSELAGE STRUCTURAL PARTS.		
INVESTIGATED BUT HAND OPERATIONS RESULT IN HIGH LABOR COSTS.			
WORK STATUS			
*** * ***** DELINQUENT STATUS REPORT *****			
*** * - - - - -			
PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* 5 79 4124	FABRICATION OF CONTROL ACTUATION SYSTEM HOUSINGS	930	
PROBLEM	SOLUTION		
*** * THE HOUSINGS USED IN TACTICAL WEAPONS CONTROL SYS	PROVIDE A COMPUTER NUMERICAL CONTROL (CNC) MULTIMI		
tems are the single high cost item in the system.	SSION CENTER CAPABILITY TO PRODUCE THESE HOUSINGS		
THESE HOUSINGS ARE EXPENSIVE BECAUSE MID VOLUME	AT AN ANNUAL RATE OF 12,000 TO 50,000.		
PRODUCTION CAPABILITIES HAVE NOT BEEN ESTABLISHED			
WORK STATUS			
*** * A PROPOSAL HAS BEEN RECEIVED AND IS PRESENTLY BEING EVALUATED. THIS PROJECT IS BEHIND SCHEDULE DUE TO ADDITIONAL TIME FOR PROPOSAL SUBMISSION. THIS PROJECT SHOULD PROVIDE ECONOMICAL MID-VOLUME PRODUCTION OF CONTROL SYSTEM HOUSINGS.			

PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* 6 79 7807	PROGRAMMED OPTICAL SURFACING EQUIPMENT AND METHODOLOGY (CAM)	138	FABRICATION CADCAM
PROBLEM	SOLUTION		
*** * CURRENT TECHNIQUES FOR PITCH BUTTONING AND BLOCKING PRECISION LENSES USE OLDER CONVENTIONAL EQUIPMENT. ACCURACY DEPENDS ON THE SKILL AND EXPERIENCE OF WELL TRAINED MASTER OPTICIANS WHO ARE BECOMING SCARCE.	ADOPT COMPUTER TECHNIQUES AND INSTRUMENTATION WITH CONTROLS TO PITCH BUTTONING AND BLOCKING OPERATIONS. THE END PRODUCT WILL BE AN INTEGRATED SURFACING SYSTEM IMPLEMENTED IN THE FIRE CONTROL FABRICATION FACILITY AT ARRADCOM.		
WORK STATUS			
*** * PROCUREMENT PACKAGE FOR A PROGRAMMABLE CURVE GENERATING/RADIUS TRUEING MACHINE HAS BEEN COMPLETED. A SPECIFICATION DELINEATING THE CHAR AND PERFORMANCE REQ FOR A COMPUTER CONTROLLED GRINDING/POLISHING MACHINE HAS BEEN INITIATED.			
PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* F 79 9938	THREE COLOR LIGHT EMITTING DIODE DISPLAY UNIT	510	FABRICATION CADCAM
PROBLEM	SOLUTION		
*** * PRESENT MANUFACTURING METHODS ARE TOO COSTLY AND COMPLICATED SINCE MANY COMPONENTS HAVE TO BE INTERFACE CONNECTED AND MOUNTED BY HAND.	ESTABLISH NEW FABRICATION AND HANDLING TECHNIQUES TO REDUCE COSTS AND STILL PROVIDE A RELIABLE MODULE.		
WORK STATUS			
*** * A PROCUREMENT PACKAGE HAS BEEN PREPARED. THE PACING R&D FOR THIS PROJECT UNDERWENT CHANGES AND THE DESIGN OF THE MODULE WAS NOT FINALIZED UNTIL 1 MAR 79. THIS PROJECT IS CURRENTLY 9 MONTHS BEHIND SCHEDULE.			
PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* R 79 3268	AUTOMATIC CONTROL OF PLATING (CAM)	450	FABRICATION CADCAM
PROBLEM	SOLUTION		
*** * THE BATHS USED FOR PLATING PRINTED WIRING BOARDS HAVE AN EXTREMELY LARGE NUMBER OF VARIABLES WHICH INFLUENCE PCB QUALITY. IF ANY VARIABLE DRIFTS OUT OF RELATIVELY NARROW BOUNDS, IMPAIRED QUALITY RESULTS.	DEVELOP CENTRALIZED CONTROLLER SYSTEM WHICH WILL SENSE MULTIPLE INPUTS, KEEPING PROCESS PARAMETERS IN BALANCE.		
WORK STATUS			
*** * PRESENT EFFORT IS BEING CARRIED OUT UNDER PROJECT R783268.			

ARMY CADCAM PROJECTS  
08/31/79

PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* R 79 3441	APPLICATION OF HIGH ENERGY LASER MANUFACTURING PROCESSES	400	FABRICATION CADCAM
PROBLEM	SOLUTION		
* COST IS A CRITICAL FACTOR IN CONVENTIONAL WELDING ASSOCIATED WITH THE MANUFACTURE OF HIGH VOLUME MISSILE SYSTEMS SUCH AS CONTAINERS, LAUNCHERS, ETC.	INTEGRATE HIGH ENERGY LASER TECHNOLOGY AND COMPUTE AIDED MANUFACTURING CONTROLS INTO SYSTEMS CAPABLE OF HIGH PRODUCTION RATES AND MINIMAL COSTS.		
* THE IMPLEMENTATION OF LASER PROCESSES HAS THE POTENTIAL FOR ENORMOUS COST SAVINGS.			
WORK STATUS	*** EXCELLENT WELDS WERE MADE FOR ONE AND ONE QUARTER INCH THICK JOINTS.		
***	***		
PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* T 79 5082	FLEXIBLE MACHINING SYSTEMS PILOT LINE FOR TCV COMPONENTS	440	FABRICATION CADCAM
PROBLEM	SOLUTION		
* PARTS FOR TRACKED COMBAT VEHICLES ARE TYPICALLY NOT MANUFACTURED IN LARGE QUANTITIES. BECAUSE OF THIS, MASS PDN TECHNOLOGIES THAT RESULT IN LOWER P.DN COSTS ARE NOT USED.	THE ADVANTAGES OF MASS PDN CAN BE REALIZED IN PRODUCING MEDIUM QUANTITY SIZE LOTS BY A CONCEPT KNOWN AS, FLEXIBLE MACHINING SYSTEMS. THIS PROJECT WILL ADVANCE THE FMS TECHNOLOGY MAKING IT FEASIBLE TO UTILIZE FMS FOR THE MFG OF ARMY MATERIAL.		
WORK STATUS	*** WORK IS IN PLANNING STAGES. CURRENT EFFORTS ARE DIRECTED TOWARD ESTABLISHING A STEERING GROUP MADE UP OF USERS AND SUPPLIERS OF FMS TECHNOLOGY.		
***	***		
PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* 6 79 7802	ESTABLISH MACHINE TOOL PERFORMANCE SPECIFICATIONS	282	DATA BASE/DATA AUTOMATION
PROBLEM	SOLUTION		
* PROCUREMENT, ACQUISITION, AND APPLICATION OF NEW AND USED MACHINE TOOLS ARE BOTH PHYSICALLY AND ECONOMICALLY INEFFICIENT.	TESTS WILL BE DESIGNED AND PROCEDURES ESTABLISHED FOR TESTING MACHINE TOOLS AND DETERMINING OVERALL PERFORMANCE EFFICIENCY. GUIDELINES WILL BE WRITTEN FOR PROCUREMENT OF MACHINE TOOLS ACCORDING TO SPECIFIC PERFORMANCE REQUIREMENTS AND EFFICIENCIES.		
WORK STATUS	*** IN-HOUSE, PRIVATE INDUSTRY, AND MACH TOOL BUILDER PRACTICES FOR JUSTIFICATION, SELECTION, SPECIFICATION, AND TESTING WERE REVIEWED. THE CONTRACT SCOPE OF WORK TO ESTAB SYs PROCUREMENT METHODOLOGY WAS PREPARED AND CONTRACTUAL SERVICES WERE INITIATED.		
***	***		

ARMY CADCAM PROJECTS  
08/31/79

PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* H 79 9963	LOW COST E-BEAM EQUIPMENT	1027	CADCAM INTERACTION
PROBLEM	SOLUTION		
*** * ELECTRON BEAM PHOTOLITHOGRAPHY IS NEEDED FOR DEFINING ARTWORK, PHOTO-MASKS, OR DIRECT EXPOSURE ON A WAFER WHERE CLOSE DEFINITION IS ESSENTIAL. IT IS COSTLY BECAUSE PRESENT EQUIPMENT IS DESIGNED FOR LARGE AREA EXPOSURE AND HIGH THROUGHPUT.	DEVELOP A LOWER COST E-BEAM EXPOSURE MACHINE SUITED TO LOW VOLUME MILITARY APPLICATIONS. RETAIN THE 1/4 MICROMETER RESOLUTION AND HIGH REGISTRATION CAPABILITY.		
WORK STATUS			
*** * ***** DELINQUENT STATUS REPORT *****			
***			
PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* T 79 5024	GEAR DESIGN MFG UTILIZING COMPUTER TECHNOLOGY, CAM-PPH2	205	CADCAM INTERACTION
PROBLEM	SOLUTION		
*** * THE CONTROL OF DIMENSIONAL TOLERANCES OF FORGED BEVEL GEARS PRESENTS A UNIQUE PROBLEM SINCE THESE GEARS ARE NOT MFG. TO THEORETICAL EQUATIONS. THE BEVEL GEAR IS NOT DEFINED DIMENSIONALLY BUT IS PRESENTED AS REQUIREMENTS FOR TOOTH BEARING PATTERN.	THIS PROGRAM WILL ELIMINATE THE CURRENT TRIAL AND ERROR METHODS BY UTILIZING CADCAM METHODS AND INTRACTIVE GRAPHICS TECHNIQUES. EXCESSIVE SCRAP, UNEXPECTED DIE WEAR AND BREAKAGE, AND THE HIGH COST OF FORGING DIES WILL BE ADDRESSED.		
WORK STATUS			
*** * PHASE 1 IN A 3 PHASE CONTRACT WAS AWARDED DURING JUNE 1979.			
***			
PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* 6 79 7724	GROUP TECHNOLOGY OF WEAPON SYSTEMS	83	PLANNING/GROUP TECH
PROBLEM	SOLUTION		
*** * THERE IS A NEED TO REDUCE AND CONTROL THE PROLIFERATION OF PARTS AND DESIGNS FOR ITEMS MANUFACTURED AT WATERLIFT ARSENAL.	THE ARMY HAS PURCHASED A GROUP CLASSIFICATION AND CODING SOFTWARE PACKAGE. ONCE THIS SYSTEM IS IMPLEMENTED, IT SHOULD BE POSSIBLE TO REDUCE THE NUMBER OF DIFFERENT PARTS THRU STANDARDIZATION.		
WORK STATUS			
*** * DRAWINGS HAVE BEEN CODED, ROUTINGS ASSEMBLED, AND PRODUCTION QUANTITIES DETERMINED. A CONTRACT TO AN ALYZE THIS DATA IS IN THE FINAL PURCHASING CYCLE.			
***			

PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* 6 79 7949	APPLICATION OF GROUP TECHNOLOGY TO RIA MFR (CAM)	127	PLANNING/GROUP TECH
<b>PROBLEM</b>			
***	* PRESENT PLANNING, SCHEDULING, AND MANUFACTURE OF WEAPON ASSEMBLIES AND COMPONENTS ARE BY SEPARATE LOTS AND PARTS WHICH REQUIRE MULTIPLE, MACHINING OPERATIONS, SET-UPS AND CHANGES OF TOOLING, AND CAUSE LOSS OF TIME AND MONEY.		ACTURE WEAPON ASSEMBLIES AND COMPONENTS AS FAMILIES S-OF-PARTS. MATCH PARTS BY CONTOUR AND SIZE FOR SIMULTANEOUS MACHINING AND SUB-GROUP FOR MORE EFFICIENT MACHINING AND ASSEMBLY.
<b>WORK STATUS</b>			
***	* A CONTRACT TO PROVIDE TRAINING IN CLASSIFICATION AND CODING USING THE MICLASS SYSTEM IS IN THE FINAL STAGES. TWO CRT WERE APPROVED FOR PURCHASE.		
<b>PROJ NUMBER</b>			
* 6 79 7963	GROUP TECH CELLULAR MFG FOR FC COMPONENTS ASSEMBLIES	188	PLANNING/GROUP TECH
<b>PROBLEM</b>			
***	* FIRE CONTROL MANUFACTURING HAS RESULTED IN THE PROLIFERATION OF MANUFACTURING INFORMATION, LONG SET-UP TIMES OR MULTIPLE RESETTING OF MACHINES, AND HIGH UTILIZATION OF MACHINES, LONG AND UNCERTAIN THROUGHPUT TIMES, AND HIGH WORK-IN PROGRESS.		THROUGH GROUP TECHNOLOGY PART FAMILIES, MACHINE GROUPS, TOOL GROUPS AND WORK GROUPS WILL BE STARLISHED TO REALIZE THE FOLLOWING - REDUCED PLANNING EFFORT, SET-UP TIME, WORK-IN PROGRESS, LEVEL OF SCRAP AND MORE EFFECTIVE MACHINE OPERATIONS.
<b>WORK STATUS</b>			
***	* INITIAL PLANNING HAS BEEN COMPLETED. A CONTRACTOR HAS BEEN SELECTED.		
<b>PROJ NUMBER</b>			
* 5 79 4322	MMT DESIGN/CHAR OF ELEC CONT SYST FOR PROD FAC	610	MANUFACTURING CONTROL
<b>PROBLEM</b>			
***	* UNCERTAINTY OF THE EFFECT OF LONG TERM STORAGE DURING PLANT LAYAWAY ON ELECTRONIC CONTROL SYSTEMS AND THE ASSOCIATED IMPACT ON PRODUCTION BASE LEAD TIME.		ANALIZE DATA CONCERNING DEGRADATION OF ELECTRONIC SYSTEMS DURING PERIODS OF DORMANCY AND DEVELOP CRITERIA FOR LAYAWAY PLANNING AND FUTURE SYSTEM DESIGN.
<b>WORK STATUS</b>			
***	* WORK PLANS HAVE BEEN PREPARED TO IDENTIFY POTENTIAL PROBLEM AREAS AND LAYAWAY PROCEDURES FOR SEVERAL AMMO PRODUCTION FACILITIES. PLANS TO IMPLEMENT A CYCLE PROCEDURE HAVE BEEN DEVELOPED. DATA CAPTURE FORMS WERE DEVELOPED FOR FAILURE REPORTS + ANALYSES		

ARMY CADCAM PROJECTS  
08/31/79

PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* R 79 3445	PRECISION MACHINING OF OPTICAL COMPONENT	300	MANUFACTURING CONTROL
PROBLEM	SOLUTION		
*** * EXISTING PRECISION MACHINING FACILITIES CANNOT KEEP UP WITH THE DEMAND, MEET OPTICAL DESIGN REQUIREMENTS, MEET PRODUCTION SCHEDULES, AND STAY WITHIN REASONABLE COST BOUNDARIES.	INTEGRATE BOTH THE WELL PROVEN ERDA DEVELOPED SINGLE POINT DIAMOND MACHINING CAPABILITIES AND THE DEVELOPING INTERFEROMETRIC AIDED AND COMPUTER CONTROLLED TECHNOLOGY INTO A MANUFACTURING METHOD.		
WORK STATUS	*** * A PROCUREMENT PACKAGE WAS COMPLETED. PROPOSALS WERE RECEIVED AND EVALUATED. CONTRACT AWARD IS EXPECTED IN JULY.		
PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* 5 79 6682	SIMULATION OF AMMUNITION PRODUCTION LINES	170	SIM, MODEL, OP RESCH
PROBLEM	SOLUTION		
*** * METHODS ARE NEEDED FOR DESIGNING PRODUCTION LINES OPERATING IN A REAL ENVIRONMENT AND SUBJECT TO THE UNCERTAINTIES ASSOCIATED WITH MACHINE BREAKDOWNS AND SCHEDULED MAINTENANCE.	USE COMPUTER PROGRAM TO DEVELOP SIMULATIONS OF THE OPERATION OF MODEL LINE MODULES FOR PRODUCTION AND MODERNIZATION + EXPANSION.		
WORK STATUS	*** * MISSISSIPPI ARMY AMMO PLANT WAS SELECTED LINE FOR SIMULATION. FACTORS INCLUDE MACHINE RATES, EFFECT RATES, MAINTENANCE SCHEDULED AND UNSCHEDULED, BUFFER SIZES, OPERATION EXPERIENCE, MACHINE AVAILABILITY, STATISTICAL DISTRIBUTION OF MACHINE FAILURES.		
PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* 5 79 6716	MATH MODEL OF FORMING OPERATIONS FOR ARTILLERY DESIGN	306	SIM, MODEL, OP RESCH
PROBLEM	SOLUTION		
*** * TRIAL AND ERROR METHODS AND THE ABSENCE OF PROVEN AUTOMATED DESIGN TECHNIQUES FOR TOOLING CAUSE UNEXPECTED FAILURES IN FORMING OPERATIONS AND DELAYS IN STARTUP OF AMMUNITION PRODUCTION LINES.	DEVELOP ANALYTICAL MODELS AND AUTOMATED TOOL DESIGN METHODS OF CRITICAL METAL FORMING OPERATIONS. TOOL DESIGNS THUS GENERATED WILL BE TESTED IN A PRODUCTION SETTING TO VERIFY THE COMPUTER MODELS. PROVEN MODELS ARE APPLICABLE TO CURRENT AND FUTURE ITC		
WORK STATUS	*** * A CONTRACT WAS AWARD TO BATTELLE ON 16 MAY 79.		

PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* 1 79 7292	IMPROVED PROD PROC TO REDUCE COST OF TESTING MICROPROCESSOR	53	
PROBLEM	SOLUTION		
*** * TESTING OF CPU CARDS INTERMITTENT MICROPROCESSOR PART FAILURES ARE MOST DIFFICULT PROBLEMS TO SOLVE. STD AUTOMATIC TEST EQUIPMENT BECOMES INEFFICIENT, OR UNPREGNABLE, WHEN CMPLX INTEGRATED CKTS ARE PORTIONS OF THE PRINTED CKT CARD TESTED.	DEVELOP METHODS OF ISOLATING LARGE NUMBER OF LEADS ON SAME BUSS FOR TEST PURPOSES, USE PLUGGABLE CPU (REPLACING IT WITH A SIMULATOR WHENEVER THE PCR FAILS), AND DEVELOP PROGRAMMING TECHNIQUES.	TEST, INSP, EVAL	
WORK STATUS			
*** * ***** DELINQUENT STATUS REPORT *****			
PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* 5 79 3961	IMPROVED 3-D VIBRATION ACCEPTANCE TEST FOR ART FUZES	282	
PROBLEM	SOLUTION		
*** * CURRENT METHODS ARE COSTLY AND TIME CONSUMING, READILY EXPOSE THE TEST ITEM TO TRUE SERVICE ENVIRONMENTS, AND REQUIRE THREE TESTS TO ACCOUNT FOR ALL TEST AXES.	USE OF COMPUTERIZED 3-D VIBRATION / SHOCK TESTING AS AN ACCEPTANCE TOOL SOLVES TECHNICAL + ECONOMIC TEST DEFICIENCIES. TEST TIME IS REDUCED.	TEST, INSP, EVAL	
WORK STATUS			
*** * 3D-VTS ENGINEERING DESIGN HAS BEEN COMPLETED. THE PROCUREMENT PROCESS COMMENCED IN MID MAY 1979. THE PLANNED FUND OBLIGATION DATE FOR NAFI DOLLARS IS THE MONTH OF SEPTEMBER 1979.			
PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* 6 79 8025	ELECTRONIC PROFILE READOUT GAGE FOR POWDER CHAMBER CONTROLS	106	
PROBLEM	SOLUTION		
*** * POWDER CHAMBER SIZE IS CHECKED BY 4-6 FLUSH PIN GAGES EACH WEIGHING ABOUT 35 LBS. FROM EACH CHECK, MACHINE ADJUSTMENTS MUST BE MADE TO MACHINE CHAMBER TO REQUIRED SPEC.	USING NEW PROXIMITY SENSING DEVICES 1 LT WEIGHT GAUGE WOULD REPLACE THE 4-6 PRESENT GAGES. IT WOULD PROVIDE A SIGNAL FOR DIGITAL READOUT AND FOR TOOL CONTROL IN LATTER PHASE OF PROJECT.	TEST, INSP, EVAL	
WORK STATUS			
*** * A REVIEW OF TECHNICAL DATA WAS CONDUCTED INCLUDING AN ON SITE INSPECTION OF THE PRESENT GAGING SYSTEM. THIS PROJECT IS FALLING BEHIND THE ORIGINAL -P16- SCHEDULE. 1-1/2 MONTH IN-HOUSE DELAY OF FUNDS IS PART OF THE PROBLEM.			

PROJ NUMBER	TITLE	PROJ CUST	TECHNOLOGY AREA
* H 79 9844	CMOS CIRCUITS USING SILICON ON SAPPHIRE -SOS-TECHNOLOGY	700	
PROBLEM	SOLUTION		
*** SAPPHIRE WAFERS ARE PRODUCED BY THE CONVENTIONAL GROWN BOWLE METHOD. THIS APPROACH IS TIME CONSUMING AND COSTLY.	THIS PROJECT WILL ESTABLISH THE PRODUCTION CAPABILITY FOR THE GROWING OF MULTIPLE RIBBON SAPPHIRE, AND FOR FABRICATING SILICON ON SAPPHIRE COMPLEMENTARY METAL OXIDE SEMICONDUCTOR MONOLITHIC CIRCUITS.	TEST, INSP, EVAL	
WORK STATUS			
***	* A PROCUREMENT DATA PACKAGE WAS SENT TO THE PROCUREMENT OFFICE ON 17 MAY 79. A CONTRACT SHOULD BE LET BY NOV 79. CONTRACTOR WILL PULL MULTIPLE SAPPHIRE RIBBONS THRU EDGE DEFINING DIES. A SILICON FILM WILL BE EPITAXIALLY GROWN ON THE SAPPHIRE RIBBONS.		
PROJ NUMBER	TITLE	PROJ CUST	TECHNOLOGY AREA
* R 79 3242	DIGITAL FAULT ISOLATION OF PRINTED CIRCUIT BOARD	425	
PROBLEM	SOLUTION		
***	* LOGICAL CIRCUIT BOARDS EMPLOYED IN MISSILES CAN FAIL IN A NUMBER OF DIFFERENT PLACES. IT IS A SLOW PROCESS TO ISOLATE THE FAULT TO THE DEFECTIVE ELEMENT.	THIS PROJECT WILL DEVELOP FAULT ISOLATION PROCEDURES APPLICABLE DURING CIRCUIT BOARD TEST TO ISOLATE FAULTS DOWN TO THE SMALLEST CIRCUIT PACKAGE ON THE BOARD. THE PROBE TRACE METHOD FOR FAULT ISOLATION WILL BE UTILIZED.	TEST, INSP, EVAL
WORK STATUS			
***	* NO WORK HAS YET BEEN DONE ON THIS FY79 PORTION. MICOM CAN EXERCISE AN OPTION ON ITS FY78 CONTRACT WITH HUGHES AIRCRAFT CO. TO COMPLETE ITS SAMPLING OF CIRCUIT BOARD TEST REQUIREMENTS AND ITS SURVEY OF AUTOMATIC TESTERS.		
PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* S 79 6693	BALL PROPELLANT DETERRENT COATING-CAM RELATED	171	
PROBLEM	SOLUTION		
***	* THE PRODUCT OF THE DETERRENT COATING STEP IN BALL PROPELLANT MANUFACTURING DEMONSTRATES SIGNIFICANT VARIABILITY IN CHARGE WEIGHT FROM BATCH TO BATCH.	BUILD A MATHEMATICAL MODEL OF THE DETERRENT PROCESS AND VALIDATE IT IN PILOT PLANT TESTS USING A PROGRAMMABLE PROCESS CONTROLLER.	CONTINUOUS FLOW PROCESS
WORK STATUS			
***	* PARTIAL MODEL OF DETERRENT COATING PROCESS CHECKED AGAINST BADGER AAP PRODUCTION DATA. GOOD FIT FOR 5 OF 6 TRANSPORT CONSTANTS. DIFFUSION COEFFICIENT, THE REMAINING CONSTANT, IS OFF BY A POWER OF 10.		

FISCAL YEAR  
80  
CAM RELATED  
MM & T  
PROJECTS

ARMY CADCAM PROJECTS  
08/31/79

PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
*** ** * 5 80 6736	TECH READINESS ACCEL THRU COMPUTER INTEGRATED MFG (CAM)	290	
PROBLEM	SOLUTION		
*** * THE LEAD TIME REQUIRED TO BRING PRODUCTION LINES TO MOBILIZATION MAXIMUM IS INTOLERABLY EXCESSIVE. A CRITICAL DETERENT IS THE EXTREME SHORTAGE OF TOOLMAKERS AND MACHINISTS.	THE DEVELOPMENT AND IMPLEMENTATION OF A COMPUTER INTEGRATED MANUFACTURING SYSTEM WILL SIGNIFICANTLY REDUCE THE REQUIREMENT FOR HIGHLY SKILLED CRAFTSMEN.		ARCHITECTURE
*** * *			
PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
*** * 1 80 7183	SEMI-AUTO COMPOSITE MANUFACTURE SYSTEM HELICOPTER SECONDARY STRU	155	
PROBLEM	SOLUTION		
*** * HELICOPTER FUSELAGE STRUCTURES HAVE HIGH MANUFACTURING COST DUE TO HIGH PART COUNT AND HIGH ASSEMBLY COSTS. METHODS OF COMPOSITE FABRICATION HAVE BEEN INVESTIGATED BUT HAND OPERATIONS RESULT IN HIGH LABOR COSTS.	FABRICATE AND DEMONSTRATE A SEMI-AUTOMATED COMPOSITE MANUFACTURING SYSTEM FOR THE PRODUCTION OF COMPOSITE HELICOPTER FUSELAGE STRUCTURAL PARTS.		FABRICATION CADCAM
*** * *			
PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
*** * R 80 101A	IMPROVED MFG. PROCESSES FOR DRY TUNED ACCELEROMETERS (CAM)	380	
PROBLEM	SOLUTION		
*** * THERE IS A NEED TO ESTABLISH MANUFACTURING METHOD S NECESSARY TO INCREASE YIELD AND REDUCE COST OF DRY TUNED ACCELEROMETERS. THE PRESENT METHOD IS LABOR INTENSIVE AND PRONE TO ERROR.	ELECTRO-DISCHARGE MACHINING CAN BE ADAPTED TO AUTOMATED MACHINING OF THE COMPLEX DRY FLEXURE SUPPORTS. THIS APPROACH WILL PROVIDE THE FLEXIBILITY TO EXPERIMENT TO OPTIMIZE THE SUPPORT DESIGN FOR QUANTITY PRODUCTION.		FABRICATION CADCAM
*** * *			

ARMY CADCAM PROJECTS  
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PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* T 80 5082	FLEXIBLE MACHINING SYSTEM , PILOT LINE FOR TCV COMPONENTS	880	FABRICATION CADCAM
PROBLEM	SOLUTION		
*** * PARTS FOR TRACKED COMBAT VEHICLES ARE TYPICALLY NOT MANUFACTURED IN LARGE QUANTITIES. BECAUSE OF THIS, MASS PDN TECHNOLOGIES THAT RESULT IN LOWER ON COSTS ARE NOT USED.	THE ADVANTAGES OF MASS PDN CAN BE REALIZED IN PRODUCING MEDIUM QUANTITY SIZE LOTS BY A CONCEPT KNOWN AS, FLEXIBLE MACHINING SYSTEMS. THIS PROJECT WILL ADVANCE THE FMS TECHNOLOGY MAKING IT FEASIBLE TO UTILIZE FMS FOR THE MFG OF ARMY MATERIEL.		
*** *	*** *		
PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* F 80 3036	CAD/CAM OF SPECIAL ELECTRONIC CIRCUITS	140	CADCAM INTERACTION
PROBLEM	SOLUTION		
*** * SEMICONDUCTOR INTEGRATED CIRCUITS NEEDED FOR SPECIAL COMMUNICATIONS EQUIP. MUST BE CUSTOM DESIGNED FOR EACH NEW APPLICATION. EACH IC REQUIRES SEVERAL MASK SETS AND A NUMBER OF IC ARE REQUIRED FOR EACH DEVICE. CONSIDERABLE ARTWORK IS REQUIRED.	DEVELOP COMPUTER AIDED MANUFACTURING TECHNIQUES THAT WILL REDUCE THE COST OF AND IMPROVE THE REABILITY OF SEMICONDUCTOR INTEGRATED CIRCUITS.		
*** *	*** *		
PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* 6 80 7949	APPLICATION OF GROUP TECHNOLOGY TO RIA MFG (CAM)	155	PLANNING/GROUP TECH
PROBLEM	SOLUTION		
*** * PRESENT PLANNING, SCHEDULING, AND MANUFACTURE OF WEAPON ASSEMBLIES AND COMPONENTS ARE BY SEPARATE LOTS AND PARTS WHICH REQUIRE MULTIPLE, MACHINING OPERATIONS, SET-UPS AND CHANGES OF TOOLING, AND CAUSE LOSS OF TIME AND MONEY.	APPLY GROUP TECHNOLOGY TO CLASSIFY, CODE AND MANUFACTURE WEAPON ASSEMBLIES AND COMPONENTS AS FAMILIES OF PARTS. MATCH PARTS BY CONTOUR AND SIZE FOR SIMULTANEOUS MACHINING AND, SUB-GROUP FOR MORE EFFICIENT MACHINING AND ASSEMBLY.		
*** *	*** *		

PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
*** * 6 80 7963	GROUP TECHNOLOGY FOR FIRE CONTROL PARTS AND ASSEMBLIES	303	
PROBLEM	SOLUTION		
*** * FIRE CONTROL MANUFACTURING HAS RESULTED IN THE PROLIFERATION OF MANUFACTURING INFORMATION, LONG SET-UP TIMES OR MULTIPLE RESETTING OF MACHINES, AND RE-UTILIZATION OF MACHINES, LONG AND UNCERTAIN TURNAROUND TIMES, AND HIGH WORK-IN-PROGRESS, ROUGHPUT TIMES, AND HIGH WORK-IN-PROGRESS.	THROUGH GROUP TECHNOLOGY PART FAMILIES, MACHINE GROUPS, TOOL GROUPS AND WORK GROUPS WILL BE ESTABLISHED TO REALIZE TIME FOLLOWING = REDUCED PLANNING TIME, SET-UP TIME, WORK-IN-PROGRESS, LEVEL OF SCRAPS AND MORE EFFECTIVE MACHINE OPERATIONS.		PLANNING/GROUP TECH
PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
*** * 5 80 4322	CHARACTERIZE DORMANCY EFFECT ON ELECTRONIC EQUIPMENT	515	
PROBLEM	SOLUTION		
*** * UNCERTAINTY OF THE EFFECT OF LONG TERM STORAGE DURING PLANT LAYAWAY ON ELECTRONIC CONTROL SYSTEMS AND THE ASSOCIATED IMPACT ON PRODUCTION BASE LEAD TIME.	ANALYZE DATA CONCERNING DEGRADATION OF ELECTRONIC SYSTEMS DURING PERIODS OF DORMANCY AND DEVELOP CRITERIA FOR LAYAWAY PLANNING AND FUTURE SYSTEM DESIGN.		MANUFACTURING CONTROL
PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
*** * 6 80 8034	MANUFACTURING SHOP FLOOR FEEDBACK SYSTEM (CAM)	84	
PROBLEM	SOLUTION		
*** * ROCK ISLAND ARSENAL'S CURRENT METHOD OF COLLECTING SHOP FLOOR DATA IS COSTLY, UNRELIABLE AND DOES NOT PROVIDE ENOUGH DATA FOR PROPER CONTROL OF PRODUCTION.	DESIGN AND INSTALL A MANUFACTURING SHOP FLOOR FEEDBACK SYSTEM UTILIZING THE LATEST ADVANCEMENTS IN COMPUTER HARDWARE AND PRODUCTION MANAGEMENT CONCEPTS.		MANUFACTURING CONTROL

ARMY CADCAM PROJECTS  
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PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* H 80 3010	MILLIMETER-WAVE SOURCES FOR 60, 94, AND 140 GHZ	900	MANUFACTURING CONTROL
PROBLEM	SOLUTION		
***	* TO ESTABLISH A MANUFACTURING CAPABILITY FOR PRODUCTION OF IMPATT DIODES WHICH ARE UNIFORM ENOUGH TO BE FIELD REPLACEABLE IN ARMY SYSTEMS.	ESTABLISH TECHNIQUES AND PROCESSES CAPABLE OF PRODUCING SILICON DOUBLE DRIFT IMPATT SOURCES. PRECISE AND RIGOROUS COMPUTER CONTROL OF ALL MATERIAL IS REQUIRED.	
***			
PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* R 80 3281	MANUF TECH PROJ F/SILVER-ZINC GUIDANCE BATTERIES (CAM)	250	MANUFACTURING CONTROL
PROBLEM	SOLUTION		
***	* ANODE AND CATHODE MANUFACTURING FOR SILVER ZINC BATTERIES IS BASED ON TWENTY YEAR OLD TECHNIQUES. REQUIREMENTS CALL FOR IN LINE PRODUCTION AND ACCEPTANCE TESTS.	DEVELOP A COMPUTER AIDED MANUFACTURING PROCESS FOR SILVER-ZINC BATTERIES WITH CONTROLLING SENSORS FOR ACCURATELY MEASURING MATERIALS AND ELECTROCHEMICAL COMBINATION.	
***			
PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* R 80 3445	PRECISION MACHINING OF OPTICAL COMPONENTS	400	MANUFACTURING CONTROL
PROBLEM	SOLUTION		
***	* EXISTING PRECISION MACHINING FACILITIES CANNOT KEEP UP WITH THE DEMAND, MEET OPTICAL DESIGN REQUIREMENTS, MEET PRODUCTION SCHEDULES, AND STAY WITHIN REASONABLE COST BOUNDARIES.	INTEGRATE BOTH THE WELL PROVEN ERDA DEVELOPED SINGLE POINT DIAMOND MACHINING CAPABILITIES AND THE DEVELOPED INTERFEROMETRIC AIDED AND COMPUTER CONTROLLED TECHNOLOGY INTO A MANUFACTURING METHOD.	
***			

PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
*** * 6 80 7928	ROBOTIZED BENCHING OPERATIONS	113	
PROBLEM			
*** * BENCHING OPERATIONS ON BREECHBLOCKS AND RINGS ARE UNSAFE AND TIME CONSUMING.	SOLUTION		MAT HANDLING/STORAGE
*** * .			
PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
*** * 1 80 7292	MICROPROCESSOR AND LSI FAULT ISOLATION AND TESTING	150	
PROBLEM			
*** * TESTING OF CPU CARDS INTERMITTENT MICROPROCESSOR PART FAILURES ARE MOST DIFFICULT PROBLEMS TO SOLVE. STD AUTOMATIC TEST EQUIP BECOMES INEFFICIENT, OR UNPREGNABLE, WHEN COMPLEX INTEGRATED CKTS ARE PORTED ON THE PRINTED CKT CARD TESTED.	SOLUTION		TEST, INSP, EVAL
*** * .			
PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
*** * 5 80 3961	IMPR (3-D) VIB ACCEPT TSTNG F ART FUZES AND S/A MECHANISMS	605	
PROBLEM			
*** * CURRENT METHODS ARE COSTLY AND TIME CONSUMING, RELY EXPENSIVE TEST ITEM TO TRUE SERVICE ENVIRONMENT, AND REQUIRE THREE TESTS TO ACCOUNT FOR ALL TEST AXES.	SOLUTION		TEST, INSP, EVAL
*** * .			

FISCAL YEAR

81

CAM RELATED

MM & T

PROJECTS

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PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* 1 81 7183	SEMI-AUTO COMP MANUF SYS F/HELI FUSELAGE SECONDARY STRUC	300	FABRICATION CADCAM
PROBLEM	SOLUTION		
*** * HELICOPTER FUSELAGE STRUCTURES HAVE HIGH MANUFACTURING COST DUE TO HIGH PART COUNT AND HIGH ASSEMBLY COSTS. METHODS OF COMPOSITE FABRICATION HAVE BEEN INVESTIGATED BUT HAND OPERATIONS RESULT IN HIGH LABOR COSTS.	FABRICATE AND DEMONSTRATE A SEMI-AUTOMATED COMPOSITE MANUFACTURING SYSTEM FOR THE PRODUCTION OF COMPOSITE HELICOPTER FUSELAGE STRUCTURAL PARTS.		
***			
PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* 6 81 7807	PROGRAMMED OPTICAL SURFACING EQUIPMENT/METHODOLOGY	126	FABRICATION CADCAM
PROBLEM	SOLUTION		
*** * CURRENT TECHNIQUES FOR PITCH BUTTONING AND BLOCKING PRECISION LENSES USE OLDER CONVENTIONAL EQUIPMENT. ACCURACY DEPENDS ON THE SKILL AND EXPERIENCE OF WELL TRAINED MASTER OPTICIANS WHO ARE BECOMING SCARCE.	ADOPT COMPUTER TECHNIQUES AND INSTRUMENTATION WITH CONTROLS TO PITCH BUTTONING AND BLOCKING OPERATIONS. THE END PRODUCT WILL BE AN INTEGRATED SURFACING SYSTEM IMPLEMENTED IN THE FIRE CONTROL FACILITY AT ARRADCOM.		
***			
PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* H 81 9845	HMT COMPUTER-AIDED FLIR ASPHERIC LENS FABRICATION CAM	518	FABRICATION CADCAM
PROBLEM	SOLUTION		
*** * ASPHERIC LENSES REQUIRED BY FLIR SENSORS HAVE SEVERE WEIGHT AND SIZE LIMITATIONS AND ARE DIFFICULT TO MFG. BECAUSE OF THE REPETITIVE PROCESS OF SURFACE SHAPING,	PROVIDE MFG. METHODS FOR PRODUCING ASPHERICAL FLIR LENS USING A SINGLE POINT DIAMOND TURNING LATHE INTEGRATED WITH COMPUTER CONTROLS AND LASER INTERFACED FEEDBACK OF CUTTING TOOL POSITIONS.		
***			

ARMY CADCAM PROJECTS  
08/31/79

PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
*** * T 81 5082	FLEXIBLE MACHINING SYS (FMS) PILOT LINE F/TCV COMPONENTS	880	FABRICATION CADCAM
PROBLEM	SOLUTION		
*** * PARTS FOR TRACKED COMBAT VEHICLES ARE TYPICALLY NOT MANUFACTURED IN LARGE QUANTITIES. BECAUSE OF THIS, MASS PDN TECHNOLOGIES THAT RESULT IN LOWER ON COSTS ARE NOT USED.	THE ADVANTAGES OF MASS PDN CAN BE REALIZED IN PRODUCING MEDIUM QUANTITY SIZE LOTS BY A CONCEPT KNOWN AS, FLEXIBLE MACHINING SYSTEMS. THIS PROJECT WILL ADVANCE THE FMS TECHNOLOGY MAKING IT FEASIBLE TO UTILIZE FMS FOR THE MFG OF ARMY MATERIEL.		
***	***	***	***
PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
*** * T 81 5086	LASER HARDENING OF TRANSMISSION COMPONENTS CAM (PHASE 1)	255	FABRICATION CADCAM
PROBLEM	SOLUTION		
*** * FLAME AND INDUCTION HARDENING IS EMPLOYED TO SURFACE HARDEN VEHICLE TRANSMISSION PARTS. THESE PROCESSES ARE INEFFICIENT.	ESTABLISH PARAMETERS AND CONTROLS NEEDED FOR LASER SURFACE HARDENING		
***	***	***	***
PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
*** * T 81 5091	HEAVY ALUMINUM PLATE FABRICATION (PHASE 1)	420	FABRICATION CADCAM
PROBLEM	SOLUTION		
*** * MANY COMBAT AND TACTICAL VEHICLE HULLS AND THEIR COMPONENTS ARE FABRICATED FROM HEAVY ALUMINUM PLATE. CUTTING THIS HEAVY ALUMINUM PLATE TO SPECIFIC CONTOURS AND WELDING THE PIECES TOGETHER REQUIRES A GREAT DEAL OF MANUAL LABOR.	ESTABLISH THE CAPABILITY TO CUT HEAVY ALUMINUM PLATE RAPIDLY USING PLASMA ARC WITH NUMERICAL CONTROL PROCESS PARAMETERS WILL BE ESTABLISHED FOR GAS METAL ARC, GAS TUNGSTEN ARC, AND ELECTRON BEAM WELDING OF HEAVY ALUMINUM PLATE.		
***	***	***	***

ARMY CADCAM PROJECTS  
08/31/79

PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* T 81 6008	LASER MACHINING (PHASE I)	250	FABRICATION CADCAM
PROBLEM	SOLUTION		
*** * CONVENTIONAL MACHINING OF DIFFICULT TO MACHINE MATERIALS IS VERY EXPENSIVE. RAPID TOOL WEAR AND LOCALIZED HEATING OF THE WORKPIECE IMPACT REMOVES MATERIALS AND METALLURGICAL CHARACTERISTICS.	THIS PROGRAM WILL DEVELOP TECHNIQUES FOR LASER MACHINING BY NUMERICAL CONTROL.		
***	***		
PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* F 81 3005	GRAPHICAL PART PROGRAMMING EVALUATION (GCPM)	115	CAD/CAM INTERACTION
PROBLEM	SOLUTION		
*** * POTENTIAL EXISTS TO EXTEND THE EXISTING COMPUTER-AIDED INTERACTIVE DESIGN SYSTEMS FOR THE CREATION OF NUMERICAL CONTROL TAPES AND THREE-DIMENSIONAL PART GEOMETRIES TO A BROAD RANGE OF DOD EQUIPMENT REQUIREMENTS.	THIS PROJECT WILL EVALUATE THE CAPABILITY OF EXISTING COMPUTER-AIDED INTERACTIVE DESIGN SYSTEMS TO PRODUCE NUMERICAL CONTROL PART PROGRAMS AND PART GEOMETRIES FOR DOD PRODUCTION REQUIREMENTS.		
***	***		
PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* F 81 3036	CAD/CAM OF SPECIAL ELECTRONIC CIRCUITS (CSEC)	2000	CAD/CAM INTERACTION
PROBLEM	SOLUTION		
*** * SEMICONDUCTOR INTEGRATED CIRCUITS NEEDED FOR SPECIAL COMMUNICATIONS EQUIP. MUST BE CUSTOM DESIGNED FOR EACH NEW APPLICATION. EACH IC REQUIRES SEVERAL MASK SETS AND A NUMBER OF IC ARE REQUIRED FOR EACH DEVICE. CONSIDERABLE ARTWORK IS REQUIRED.	DEVELOP COMPUTER-AIDED MANUFACTURING TECHNIQUES THAT WILL REDUCE THE COST OF AND IMPROVE THE RELIABILITY OF SEMICONDUCTOR INTEGRATED CIRCUITS.		
***	***		

ARMY CADCAM PROJECTS  
08/31/79

PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* T 81 5024	GEAR DIE DESIGN AND MFG UTILIZING COMPUTER TECHNOLOGY	350	
	PROBLEM		
***	* THE CONTROL OF DIMENSIONAL TOLERANCES OF FORGED BEVEL GEARS PRESENTS A UNIQUE PROBLEM SINCE THESE GEARS ARE NOT MFG. TO THEORETICAL EQUATIONS. THE BEVEL GEAR IS NOT DEFINED DIMENSIONALLY BUT IS PRESENTED AS REQUIREMENTS FOR TOOTH BEARING PATTERN.	THIS PROGRAM WILL ELIMINATE THE CURRENT TRIAL AND ERROR METHODS BY UTILIZING CADCAM METHODS AND INTRACTIVE GRAPHICS TECHNIQUES. EXCESSIVE SCRAP, DEFECTED DIE WEAR AND BREAKAGE, AND THE HIGH COST OF FORGING DIES WILL BE ADDRESSED.	CADCAM INTERACTION
	SOLUTION		
	PROJ NUMBER	TITLE	PROJ COST
* 6 81 7724	GROUP TECHNOLOGY OF WEAPON SYSTEMS (CAM)	224	TECHNOLOGY AREA
	PROBLEM		
***	* THERE IS A NEED TO REDUCE AND CONTROL THE PROLIFERATION OF PARTS AND DESIGNS FOR ITEMS MANUFACTURED AT WATERVLIET ARSENAL.	THE ARMY HAS PURCHASED A GROUP CLASSIFICATION AND CODING SOFTWARE PACKAGE. ONCE THIS SYSTEM IS IMPLEMENTED, IT SHOULD BE POSSIBLE TO REDUCE THE NUMBER OF DIFFERENT PARTS THRU STANDARDIZATION.	PLANNING/GROUP TECH
	SOLUTION		
	PROJ NUMBER	TITLE	PROJ COST
* 1 81 7248	CLOSED LOOP MACHINING T700 MID FRAME	540	TECHNOLOGY AREA
	PROBLEM		
***	* THE ENGINE MID-FRAME HAS 22 DIAMETERS WITH TOLERANCES RANGING FROM ".001 IN." THESE TOLERANCES RESULT IN HIGH MACHINING, REWORK AND INSPECTION COSTS.	DEVELOP CLOSED LOOP MACHINING THAT WILL AUTOMATICALLY COMPENSATE FOR ANY DEVIATION IN NUMERICAL CONTROLLED, PROGRAMMED PLAN THEREBY REDUCING PRODUCTION COSTS.	MANUFACTURING CONTROL
	SOLUTION		

PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
***			
* 6 81 8120	ADAPTIVE CONTROL TECHNOLOGY (CAM)	225	MANUFACTURING CONTROL
PROBLEM	SOLUTION		
***	* INEFFICIENT USE OF NC MACHINE TOOLS DUE TO CONSERVATION PROGRAMMING IS UNECONOMICAL. ALSO THE INABILITY TO MONITOR A MULTIPlicity OF TOOL FORMS CHARACTERISTIC OF NC MACHINE CAPABILITY, E.G. MANY MILL SIZES WITH DIFFERENT LOADING, IS A LIMITER.	EXTEND THE CURRENT ADAPTIVE CONTROL TECHNOLOGY TO CONTROL THE TOOL LOADS IN SMALL MILLS AND DRILLS SO THEY CAN BE PERFORMED IN THE SAME SETUPS. THIS WOULD MAXIMIZE THE USE OF BOTH NC EQUIPMENT AND TOOL SYSTEMS.	MANUFACTURING CONTROL
***			
PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
***			
* 6 81 8135	IN-PROCESS CONTROL OF MACHINING	750	MANUFACTURING CONTROL
PROBLEM	SOLUTION		
***	* DURING MFG. OF RECOIL CONTROL ORIFICES, ERRORS ARE INTRODUCED WHICH REQUIRE REWORK. CORRECTIVE ACTIONS INVOLVE COSTLY DETAILED INSPECTION AND REANALYSIS WITH COMPUTERIZED DESIGN PROGRAMS TO DEFINE POSSIBLE REWORK ALTERNATIVES.	AN IMPROVED MANUFACTURING METHOD UTILIZING ADAPTIVE CONTROLS AND AUTOMATED INSPECTION EQUIPMENT WILL BE ESTABLISHED. MACHINE TOOLS WILL BE RETROFITTED	MANUFACTURING CONTROL
***			
PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
***			
* 6 81 8154	DISTRIBUTED DIRECT NUMERICAL CONTROL (CAM)	337	MANUFACTURING CONTROL
PROBLEM	SOLUTION		
***	* NUMERICAL CONTROL MACHINE TOOLS OFFER MANY ADVANTAGES OVER CONVENTIONAL MACHINE TOOLS BUT HAVE CERTAIN DISADVANTAGES. ONE PROBLEM AREA IS GETTING MACHINE INSTRUCTIONS TO THE MACHINE TOOL AND COLLECTING MANAGEMENT INFORMATION.	ELIMINATE PHYSICAL DEVICES THAT ARE MANUALLY LOADED ON CONTROL UNITS BY PROVIDING MACHINE INSTRUCTIONS DIRECTLY FROM A CENTRAL COMPUTER. DISADVANTAGES TO DIRECT NUMERICAL CONTROL WILL BE SOLVED BY INSTALLATION OF COMPUTER NUMERICAL CONTROLS (CNC).	MANUFACTURING CONTROL
***			

ARMY CADCAM PROJECTS  
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PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* 6 81 8226	COMPUTER AIDED WORK MEASUREMENT SYSTEM (CAM RELATED)	187	MANUFACTURING CONTROL
PROBLEM	SOLUTION		
*** * TIME STUDIES AND USE OF STANDARD DATA PRESENTLY REQUIRE TIME CONSUMING MANUAL CALCULATIONS TO DEVELOP PRODUCTION STANDARDS.	DEVELOP A COMPUTERIZED WORK MEASUREMENT SYSTEM THAT WILL VIRTUALLY ELIMINATE MANUAL CALCULATIONS IN THE DEVELOPMENT OF PRODUCTION STANDARDS. ROUTINES WILL INCLUDE PROGRAMS TO DEVELOP FINISHED STANDARD S FROM RAW TIME STUDIES OR STANDARD DATA.		
***	***		
PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* R 81 3281	SILVER-ZINC GUIDANCE BATTERIES (CAM)	250	MANUFACTURING CONTROL
PROBLEM	SOLUTION		
*** * ANODE AND CATHODE MANUFACTURING FOR SILVER ZINC BATTERIES IS BASED ON TWENTY YEAR OLD TECHNIQUES. REQUIREMENTS CALL FOR IN LINE PRODUCTION AND ACCEPTANCE TESTS.	DEVELOP A COMPUTER AIDED MANUFACTURING PROCESS FOR SILVER-ZINC BATTERIES WITH CONTROLLING SENSORS FOR ACCURATELY MEASURING MATERIALS AND ELECTROCHEMICAL COMBINATION.		
***	***		
PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* T 81 6053	WELDING SYSTEMS INTEGRATION	350	MANUFACTURING CONTROL
PROBLEM	SOLUTION		
*** * OF ALL METAL WORKING PROCESSES EMPLOYED IN TRACKED COMBAT VEHICLES MANUFACTURING, WELDING IS THE MOST LABOR INTENSIVE AND AFTER MACHINING, THE MOST COSTLY. AUTOMATION WHICH COULD REDUCE THESE COSTS IS AS YET AN UNACHIEVED GOAL.	UNDERTAKE A COORDINATED PROGRAM TO INTEGRATE EXISTING EXPERTISE AND TECHNOLOGY TO ADDRESS ONE APPLICATION (XM1 HULL). EXPERTISE WILL BE IN AREAS OF WELDING PROCESS CONTROL, SENSORY TECHNOLOGY, STRESS ANALYSIS, AND COMPUTER CONTROL.		
***	***		

PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* 5 81 6716	DEV COMP-AID MODEL OF FORMING OPERATIONS FOR ARTILLERY MPTS	150	
PROBLEM	SOLUTION		
*** TRIAL AND ERROR METHODS AND THE ABSENCE OF PROVEN AUTOMATED DESIGN TECHNIQUES FOR TOOLING CAUSE UNEXPECTED FAILURES IN FORMING OPERATIONS AND DELAYS IN STARTUP OF AMMUNITION PRODUCTION LINES.	DEVELOP ANALYTICAL MODELS AND AUTOMATED TOOL DESIGN METHODS OF CRITICAL METAL FORMING OPERATIONS. TOOL DESIGNS THUS GENERATED WILL BE TESTED IN A PRODUCTION SETTING TO VERIFY THE COMPUTER MODELS. PROVEN MODELS ARE APPLICABLE TO CURRENT AND FUTURE IITE		SIM, MODEL, UP RESCH
***	***		
PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* 6 81 8136	IMPROVED IMPULSE PROGRAMMERS FOR HYDRAULIC SIMULATORS	80	
PROBLEM	SOLUTION		
*** UNDESIRABLE SHOCK AND VIBRATION IN TESTS OF CERTAIN RECOIL MECHANISMS LIMIT THE EXTENT OF TESTING THAT CAN BE ACCOMMODATED ON THE HYDRAULIC ARTILLERY TEST SIMULATOR.	DESIGN AND MANUFACTURE IMPROVED IMPULSE PROGRAMMERS TO GET BETTER SIMULATED FIRING THAT WILL BE MORE EFFECTIVE FOR A GREATER NUMBER OF WEAPONS.		SIM, MODEL, UP RESCH
***	***		
PROJ NUMBER	TITLE	PROJ COST	TECHNOLOGY AREA
* 6 81 7928	ROBOTIZED BENCHING OPERATIONS (CAM)	287	
PROBLEM	SOLUTION		
*** BENCHING OPERATIONS ON BREACHBLOCKS AND RINGS ARE UNSAFE AND TIME CONSUMING.	DEVELOP INDUSTRIAL ROBOT TO PERFORM THESE OPERATIONS.		MAT HANDLING/STORAGE
***	***		

ARMY CADCAM PROJECTS  
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PROJ NUMBER	TITLE	PROJ COST
# 1 81 7175	AUTOMATED BLADE CONTOUR INSPECTION/COMPUTER AIDED INSPECTION	275

PROBLEM

\*\*\*  
\* IT IS NECESSARY TO MEASURE THE CONTOUR OF CERTAIN  
\* HELICOPTER SURFACES WITH A HIGH DEGREE OF ACCURA  
CY. HAND MEASUREMENTS ARE TIME CONSUMING AND SUSC  
EPITABLE TO ERRORS. CONVENTIONAL MEASURING SYSTEMS  
USING CONTACT PROBES ARE NOT ADEQUATE.

SOLUTION

DESIGN AND DEVELOP A COMPUTER AIDED GAUGING SYSTEM  
TO AUTOMATICALLY INSPECT CONTOURS OF SPARS AND A1  
RFOLIS OF HELICOPTER ROTOR BLADES.

TEST, INSP, EVAL

TECHNOLOGY AREA

# APPENDIXES

APPENDIX A

CAM

TECHNOLOGY AREAS

### TECHNOLOGY AREAS DESCRIPTIONS

To aid in analyzing individual MMT projects, each CAM related project is categorized into one of the following technology areas. These tech areas were originally identified in the Air Force's ICAM Program and were refined by the MTAG CADCAM Subcommittee.

Underlying the optimum benefits obtainable from utilizing CAM technology is the systems approach. Interrelationships between the various subsystems within an organization must be taken into consideration. These technology areas represent the "system" and direct thinking toward an integrated approach.

#### 100 ARCHITECTURE

The purpose of the manufacturing architecture is to provide a clear understanding of the manufacturing environment and the interrelationships between subsystems that exist today. The manufacturing architecture, or framework provides a common baseline in building integrated manufacturing systems.

#### 200 FABRICATION

The fabrication technology area serves as a focus for all other technology area activities. Projects categorized into this area are directed toward increasing the productivity of manufacturing by systematically applying computer technology to all functions which directly and indirectly participate in fabricating parts.

#### 300 DATA BASE/DATA AUTOMATION

Data base and data automation technology required to support integration of the many stages and disciplines of manufacturing.

#### 400 CADCAM INTERACTION

The purpose of this technology thrust area is to establish subsystems and procedures which will integrate the efforts of product design and manufacturing. The underlying concept is that of a common data base between engineering and manufacturing.

#### 500 PLANNING AND GROUP TECHNOLOGY

Technology directed at optimizing process planning, production scheduling and control, factory layout and other tasks normally performed by indirect personnel that have a significant impact on manufacturing cost.

#### 600 MANUFACTURING CONTROL

Generic technology for producing management oriented information tools for scheduling, monitoring and controlling operations within the manufacturing environment. Closely related to the fabrication and planning and group technology areas.

#### 700 ASSEMBLY

The integration of computer aided technology into assembly operations.

#### 800 SIMULATION, MODELING AND OPERATIONS RESEARCH

Soft technology for optimizing manufacturing systems through the application of operations research techniques.

#### 900 MATERIALS HANDLING AND STORAGE

The integration of computer aided technology to aid in material handling. Objectives here include complying with OSHA and EPA standards and reducing costs and materials handling time through automated material storage, handling, and retrieval systems.

1000 TEST, INSPECTION AND EVALUATION

Develop and transition real time, computerized, nondestructive testing techniques for use in fabrication and assembly operations. Emphasis is put on automatic, in-process inspection and decision making without human intervention.

1100 CONTINUOUS FLOW PROCESSES

This technology area addresses the range of manufacturing processes that, for the most part, are continuous with minimum human interaction.

# **APPENDIX B**

## **SUMMARY CHARTS**

TECHNOLOGY AREAS  
SUMMARY

PROJECT	THRUST AREA (\$000)										
	100	200	300	400	500	600	700	800	900	1000	1100
1 79 7183		100									
1 79 7292										53	
5 79 3961			930							282	
5 79 4124											
5 79 4322											
5 79 6682											
5 79 6693											
5 79 6716											
5 79 6736	256										
6 79 7724					83						
6 79 7802				282							
6 79 7807		138									
6 79 7949						127					
6 79 7963						188					
6 79 8025										106	
F 79 9938		510									
H 79 9844										700	
H 79 9963				1027							
R 79 3242										425	
R 79 3268		450									
R 79 3441		400									
R 79 3445						30					
T 79 5024				205							
T 79 5082		440									
1 80 7183		155									
1 80 7292										150	
5 80 3961										605	
5 80 4322											
5 80 6736	290						515				
6 80 7928											
6 80 7949											
6 80 7963											
6 80 8034					155				113		
					303		84				

TECHNOLOGY AREAS  
SUMMARY  
(cont'd)

PROJECT	THRUST AREA (\$000)											
	100	200	300	400	500	600	700	800	900	1000	1100	
F 80 3036				140								
H 80 3010						900						
R 80 1018		380										
R 80 3281						250						
R 80 3445						400						
T 80 5082		880										
1 81 7175											275	
1 81 7183		300										
1 81 7248						540						
5 81 6716								150				
6 81 7724					224							
6 81 7807		126										
6 81 7928					225							
6 81 8120						750						
6 81 8135							337					
6 81 8136							187					
6 81 8154								80				
6 81 8226												
F 81 3005				115								
F 81 3036				2000								
H 81 9845		518										
R 81 3281					250							
T 81 5024				350								
T 81 5082		880										
T 81 5086		255										
T 81 5091		420										
T 81 6008		250					350					
T 81 6053												
TOTAL Number	2	17	1	6	7	13	-	4	2	8	1	
	Dollar	546	7132	282	3837	1305	5473	-	706	400	2596	171

TECHNOLOGY AREAS  
SUMMARY  
BY FISCAL YEARS

FISCAL YEAR	THRUST AREA (\$000)												
	100	200	300	400	500	600	700	800	900	1000	1100	TOTAL	
79	256	2968	282	1232	398	910	---	476	---	1566	171	8259	
80	290	1415	---	140	458	2149	---	---	113	755	---	5320	
81	---	2749	---	2465	449	2414	---	230	287	275	---	8869	
TOTAL	546	7132	282	3837	1305	5473	---	706	400	2596	171	22448	

APPENDIX C  
PROJECT INDEX

## INDEX OF PROJECTS

by

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Ammunition	5 79 3961 . . . . .	10
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Weapons	6 80 7928 . . . . .	17
Weapons	6 81 7928 . . . . .	25
Weapons	6 79 7949 . . . . .	8
Weapons	6 80 7949 . . . . .	14
Weapons	6 79 7963 . . . . .	8
Weapons	6 80 7963 . . . . .	15
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MICOM	R 79 3445 . . . . .	9
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